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Kapitel: 2: The investigated area

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2. THE INVESTIGATION AREA

2.1. PHYSIOGRAPHY

The present study covers an area in eastern Sindhupalchok and western Dolakha District between the Sunkosi and Tamakosi Rivers in the central midlands of Nepal (Figs. 2.1, 2.2). The relief is hilly and steep and there are hardly any flat plains even along the rivers.

2.2. POPULATION

The region is - as the middle hills of Nepal generally are - characterized by dense population, and thus progressive deforestation and erosion (KHADKA 1981). Besides a few variably compact villages, the houses are scattered over the flanks and ridges of the area. The population density is recorded with 84 per km^2, with a per capita land holding of 0.04 ha (mean of Sindhupalchok and Dolakha District, Nepal District Profiles 1981).

A variety of people lives here. The dominating group are the Nepali-speaking Brahmin and Chhetri (over 50%) with their Hindu religion and caste system. They are followed by the Tamangs (over 20%), a Buddhist Tibeto-Burman-speaking community. Of the remaining groups the Newari (about 5%) should be mentioned (BISTA 1980, DOBREMEZ et al. 1974).

2.3. ECONOMY

The economy depends almost exclusively on agronomy, which is, because of the variation in climate, diverse. An elaborate terrace-system with mainly rice, wheat, maize and mustard in the lower parts and potatoes,

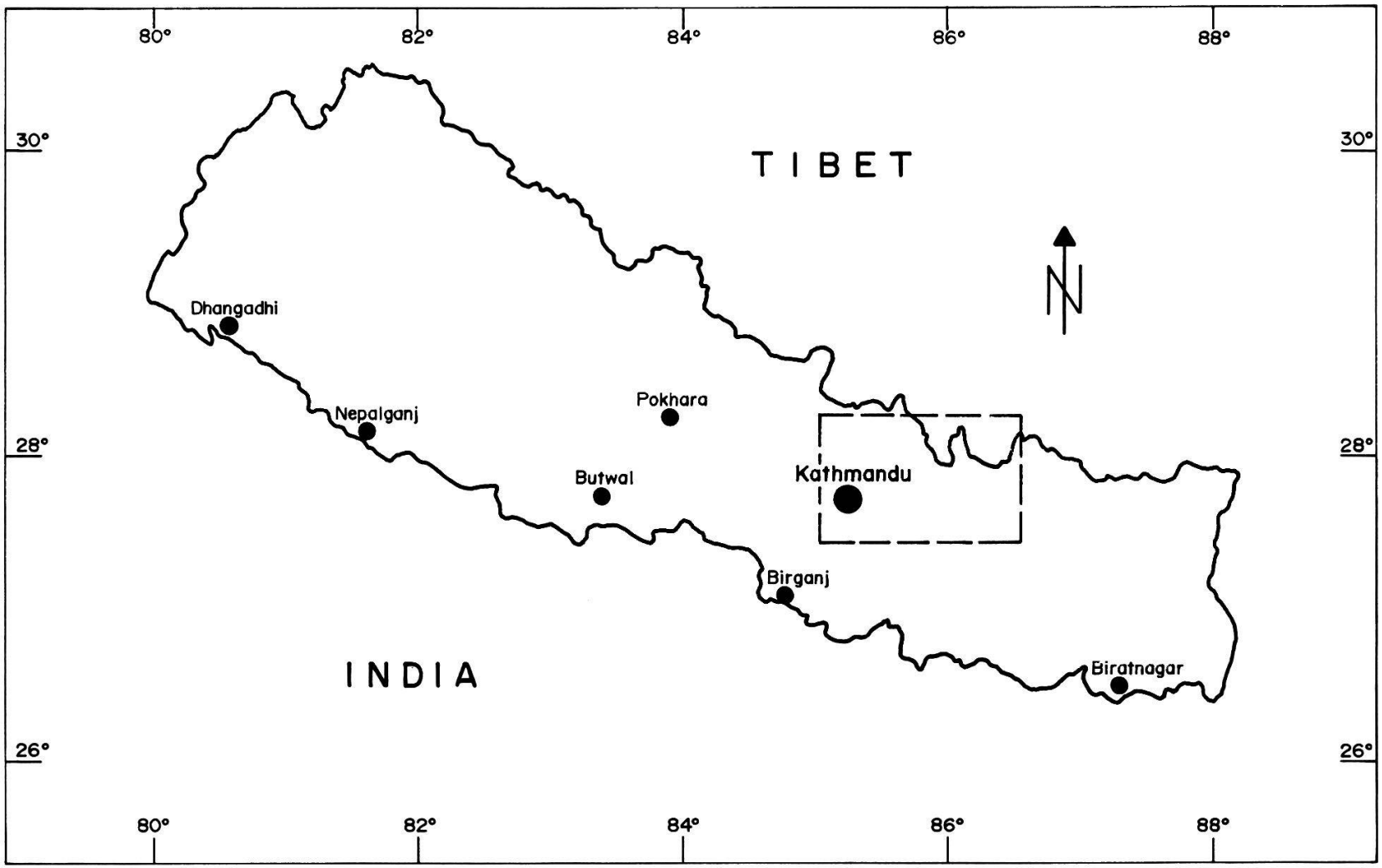

80°
82°
84°
86°
88°
30°
28°
26°
TIBET
INDIA
N
Dhangadhi
Nepalganj
Pokhara
Butwal
Kathmandu
Birganj
Biratnagar

Fig. 2.1. Nepal

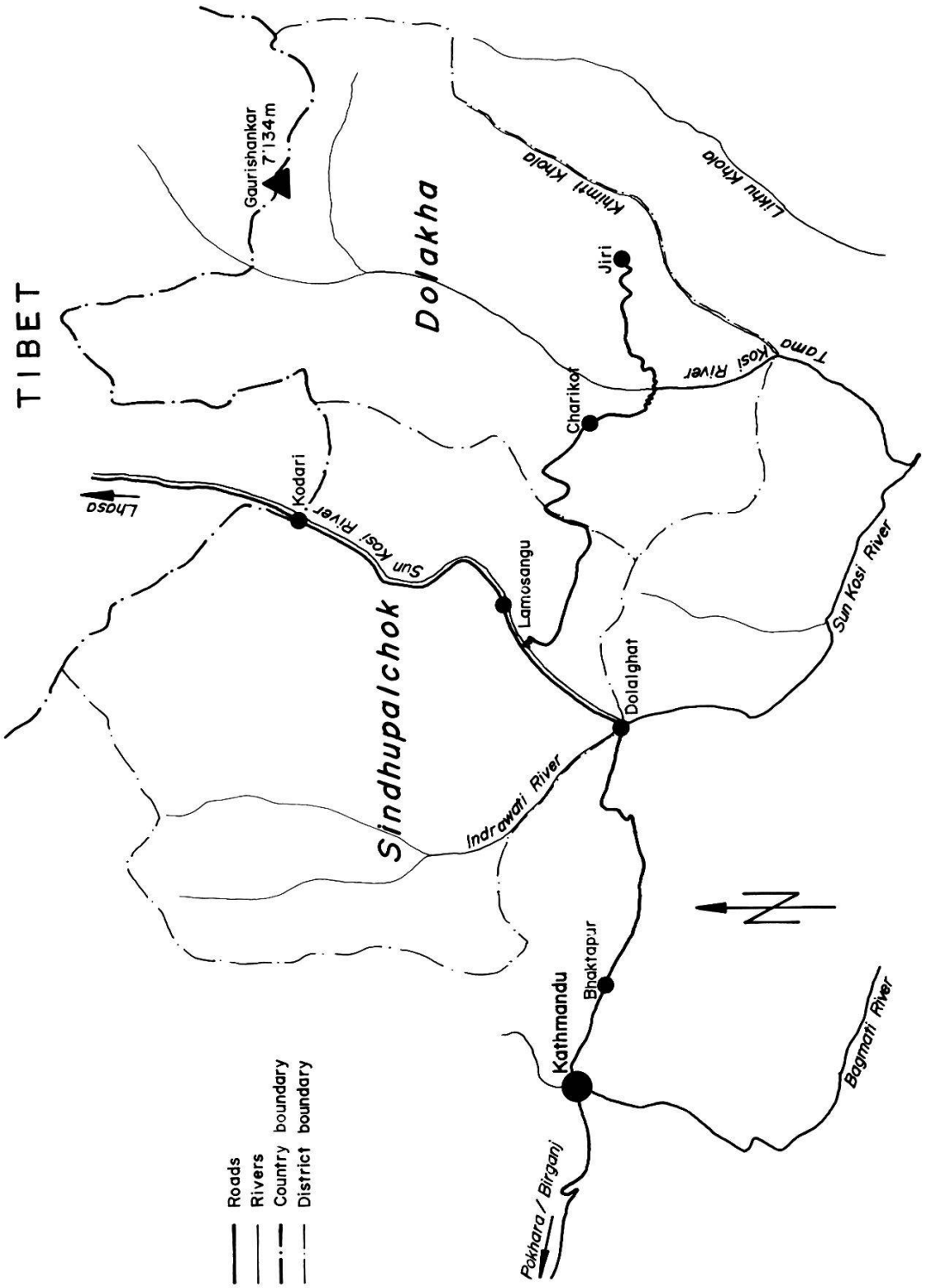


Fig. 2.2. Situation of study area
Abb. 2.2. Lage des Untersuchungsgebietes

maize, millet, barley and buckwheat in the higher areas can be seen, as can extensive pastures and shrubland or forests.

The whole region is easily accessible by the Arnico Highway, opened 1967 and leading from Kathmandu to Lhasa. It is one of the important trading routes to Tibet. The same highway is the gate to the whole Solu-Khumbu Region with its Sherpa community of Tibetan origin. This region, with Mount Everest as a magnet, is the destination of numerous mountaineering expeditions and trekkers.

A joint Nepali-Swiss Integrated Hill Development Project (IHDP) was started by the Swiss Technical Cooperation in 1974 with the aim of developing agronomy, education, forestry, health, small scale and cottage industry, and water supply and irrigation. The project entered its third phase, the handing-over, in 1985.

Also in 1974 and in connection with IHDP the Lamosangu-Jiri Road Project (LJRP) was started. From 1976-1985 a road of 110 km was built to connect the Arnico Highway with the Dolakha district (Fig. 2.2). In both projects much emphasis is laid on erosion control and protection of nature (NEVILLE 1985, SCHAFFNER 1985). The study in hand is part of this effort.

2.4. GEOLOGY AND TECTONICS

The Himalaya is a young tertiary mountain range still being uplifted. The most important structures of the present region are the WNW-ESE oriented folds and schuppen with the separating thurst faults. The rock can be diveded into three major types:

- crystalline rocks (various gneisses)
- metamorphic sediments (phyllites and cristalline schists)
- quaternary deposits (river deposits).

The most important types of rock are sediments of a low metamorphic grade. These are usually exceptionally schistous to thin-foliated, while the gneisses are thickly bedded. Often, very deep weathering attributable to heavy cleavage and rock characteristics can be observed. This results in a general instability, in much broken and displaced rock units (LJRP 1977). This instability is aggravated by earthquakes which

occasionally occur (HAGEN 1950-1958 and 1969, DONNER 1972, MARUO et al. 1973).

In most places, a variably thick covering of loose rock conceals the bed. This is composed of detritus and scree. The particle size distribution of this loose rock varies significantly. However, the coarse components (gravel, stones, blocks) are typically embedded in a silty, fine sandy matrix. There ist practically no clay (LJRP 1977).

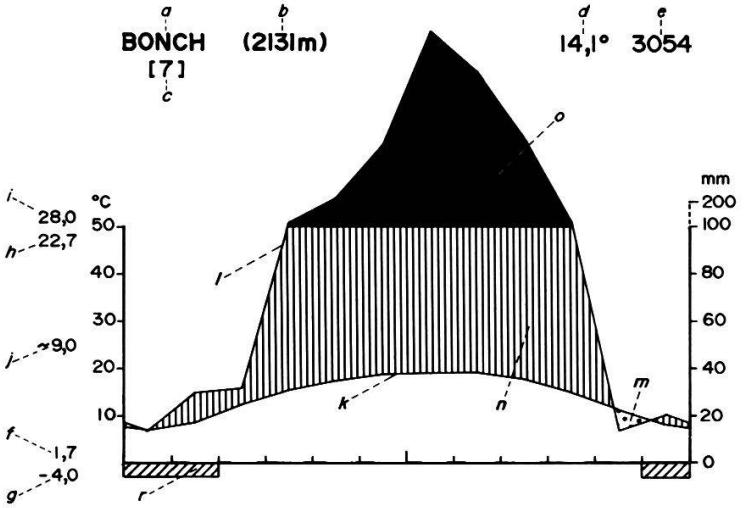
2.5. CLIMATE

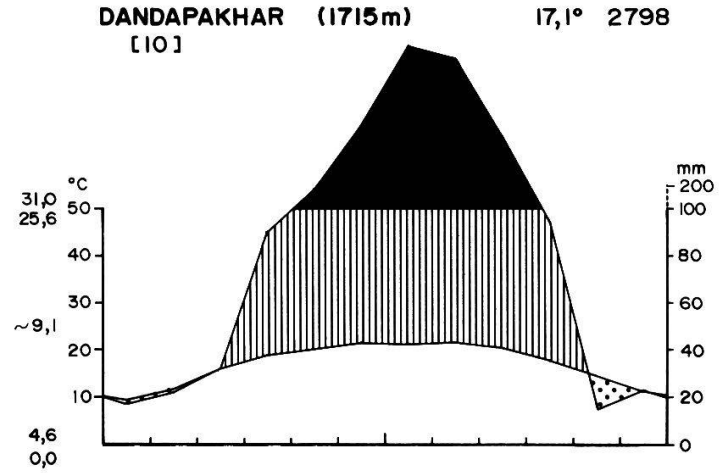
Nepal has a monsoon climate, with a pronounced rainfall maximum during the months of June to September.

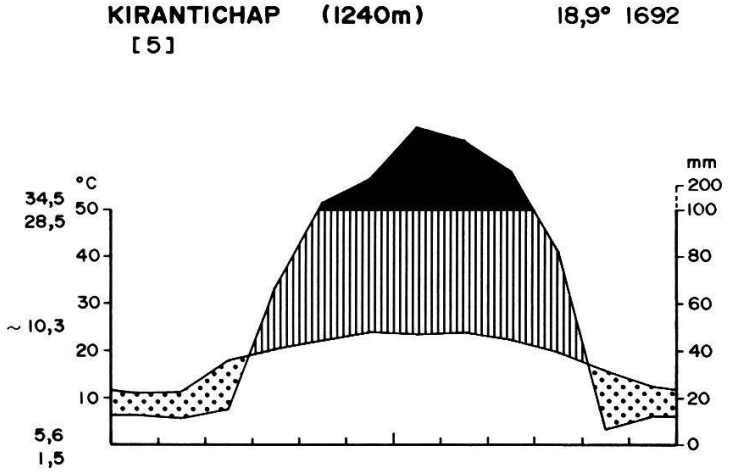
Owing to the irregular nature of the midland hills, the uneven topography and the extreme differences in altitude there exist different climatic belts (DONNER 1972, DOBREMEZ 1974b):

Fig. 2.3 (p. 15). Climate diagrams of the study area
(drawn by U. Schaffner, Emmenbrücke; IHDP-data)
Abb. 2.3 (S. 15). Klimadiagramme des Untersuchungsgebietes
(gezeichnet von U. Schaffner, Emmenbrücke; IHDP-data)

a - station
b - height above sea level
c - number of years of observation
d - mean annual temperature (in degrees centigrade)
e - mean annual precipitation (in millimeters)
f - mean daily temperature minimum of the coldest month
g - absolute minimum temperature (lowest recorded)
h - mean daily temperature maximum of warmest month
i - absolute maximum temperature (highest recorded)
j - mean daily temperature fluctuation
k - curve of mean monthly temperature (1 division = 10°C)
l - curve of mean monthly precipitation (1 division = 20 mm, i.e., 10°C = 20 mm)
m - period of relative drought (dotted) for the climate region concerned
n - corresponding relatively humid season (vertical shading)
o - mean monthly precipitation >100 mm (scale reduced to 1/10) (black areas, perhumid season)
r - months with absolute minimum below 0°C (diagonally shaded) i.e., with either late or early frosts


a
b
BONCH (213Im)
[7]
c
d
14,1° 3054
e
o
mm
200
100
80
60
40
20
0
°C
50
40
30
20
10
i
28,0
h
22,7
j
9,0
f
1,7
g
-4,0
l
k
n
m
r


DANDAPAKHAR (1715m)
[10]
17,1° 2798
mm
200
100
80
60
40
20
0
°C
50
40
30
20
10
31,0
25,6
~9,1
4,6
0,0


KIRANTICHAP (1240m)
[5]
18,9° 1692
mm
200
100
80
60
40
20
0
°C
50
40
30
20
10
34,5
28,5
~ 10,3
5,6
1,5

- hot monsoon belt (up to 1200 m)
- warm temperate monsoon belt (1200-2200 m)
- cool temperate monsoon belt (2200-3000 m)
- subarctic belt (3000-3800 m)
- arctic belt (from 3800 m).

IHDP has installed three meteorological stations. The rainfall figures recorded in the hills vary considerably according to the local topography. Bonch (2130 m a.s.l.; mean 1979-1984) has a yearly average of 3053 mm, Dandapakhar (1715 m a.s.l.; mean 1976-1984) 2830 mm and at Kirantichap (1240 m a.s.l.; mean 1981-1984) 1600 mm. 80-90% of the yearly rainfall occurs during the monsoon. There is a certain amount of rainfall during the winter months with possible snowfall above 2000 m from December to February (IHDP 1976-1985, Fig. 2.3).

The temperature varies mainly according to the altitude: Bonch shows a maximum mean of 18.5°C, Dandapakhar 21.8°C and Kirantichap 24.0°C. The minimum mean is 9.6°C at Bonch, 12.6°C at Dandapakhar and 13.8°C at Kirantichap. There can be frost in the coldest months from December to January above 1900 m (IHDP 1976-1985, Fig. 2.3).

2.6. VEGETATION AND SOIL

The vegetation is strongly connected with soil and climate, therefore we find a great variation in the Himalaya (SCHWEINFURTH 1957, STAINTON 1972). Acomparison of the vegetation zonation schemes of the Nepal Himalaya by different authors is given Fig. 2.4 (after OHSAWA 1974).

Owing to the high pressure of population the natural situation of the region has been considerably transformed: forests are rare. There is

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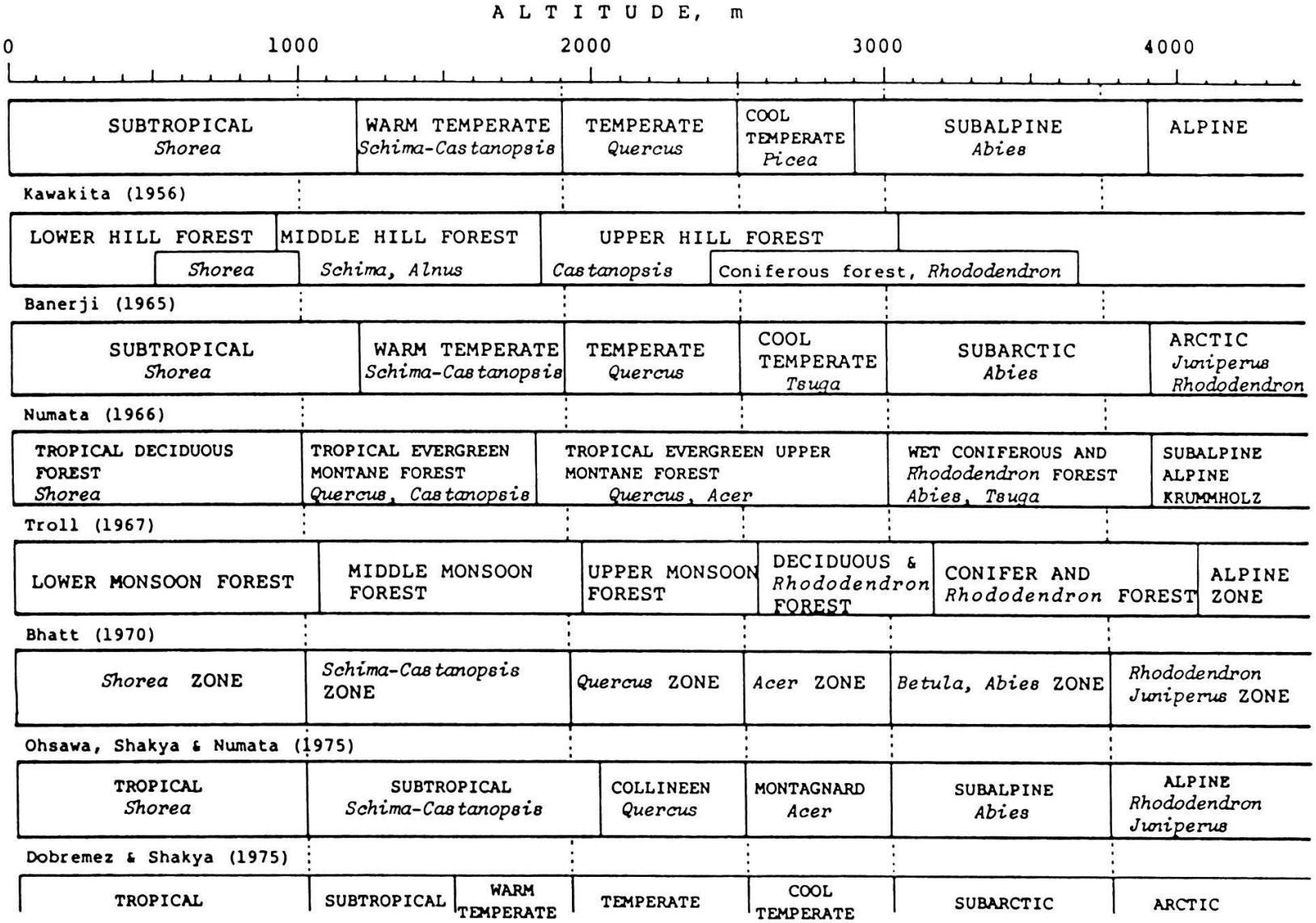
Fig. 2.4 (p. 17). Comparisons of vegetation zonation schemes in the Nepal Himalaya (after OHSAWA 1977)

Abb. 2.4 (S. 17). Vergleich verschiedener Darstellungen von Vegetationszonen im Nepal-Himalaya (nach OHSAWA 1977)


ALTITUDE, m
0
1000
2000
3000
4000
SUBTROPICAL
Shorea
WARM TEMPERATE
Schima-Castanopsis
TEMPERATE
Quercus
COOL TEMPERATE
Picea
SUBALPINE
Abies
ALPINE
Kawakita (1956)
LOWER HILL FOREST
Shorea
MIDDLE HILL FOREST
Schima, Alnus
UPPER HILL FOREST
Castanopsis
Coniferous forest, Rhododendron
Banerji (1965)
SUBTROPICAL
Shorea
WARM TEMPERATE
Schima-Castanopsis
TEMPERATE
Quercus
COOL TEMPERATE
Tsuga
SUBARCTIC
Abies
ARCTIC
Juniperus
Rhododendron
Numata (1966)
TROPICAL DECIDUOUS FOREST
Shorea
TROPICAL EVERGREEN MONTANE FOREST
Quercus, Castanopsis
TROPICAL EVERGREEN UPPER MONTANE FOREST
Quercus, Acer
WET CONIFEROUS AND Rhododendron FOREST
Abies, Tsuga
SUBALPINE
ALPINE
KRUMMHOLZ
Troll (1967)
LOWER MONSOON FOREST
MIDDLE MONSOON FOREST
UPPER MONSOON FOREST
DECIDUOUS & Rhododendron FOREST
CONIFER AND Rhododendron FOREST
ALPINE ZONE
Bhatt (1970)
Shorea ZONE
Schima-Castanopsis ZONE
Quercus ZONE
Acer ZONE
Betula, Abies ZONE
Rhododendron Juniperus ZONE
Ohsawa, Shakya & Numata (1975)
TROPICAL
Shorea
SUBTROPICAL
Schima-Castanopsis
COLLINEEN
Quercus
MONTAGNARD
Acer
SUBALPINE
Abies
ALPINE
Rhododendron
Juniperus
Dobremez & Shakya (1975)
TROPICAL
SUBTROPICAL
WARM TEMPERATE
TEMPERATE
COOL TEMPERATE
SUBARCTIC
ARCTIC

hardly any forest below 1900 m except in inaccessible areas or for cultural reasons or property conditions.

According to ESPINOSA (1974), the soils of the Lamosangu-Kharidhunga area have developed from metamorphic and sedimentary rocks, chiefly augengneiss, phyllite and metamorphosed sandstone. The major soils on bench terraces are well to poorly drained, strongly to moderately acid, slightly gravelly loams, silt loams and clay loams. Where forested, the soils range from excessively drained, stony sandy loams to well drained silty clay loams. Soil reaction is strongly to very strongly acid. The soils are mainly Cambisols, Acrisols and Regosols; a few Gleysols (classification by FAO-UNESCO 1974) occur along the rivers (ESPINOSA 1974, DOBREMEZ 1976).